FLORIDA PHOSPHATE MINING INITIATIVE BRIEFING

April 4, 2003

**********DELIBERATIVE PROCESS - DO NOT RELEASE**********

Purpose: Brief Region 4 Waste Management Division Director on results of EPA Office of Radiation Programs 1978 Report of Indoor Radiation Exposure Due to Radium-226 in Florida Phosphate Lands and the effect this data may have on the Florida Phosphate Initiative.

❑ BACKGROUND

- 1975 - EPA and FDOH assess potential effects of living on reclaimed phosphate land.
  - Concluded increased risk of lung cancer from living on reclaimed land.
  - Recommended interim measure of discouraging new construction on reclaimed land.
- Based on study results, federal, state, local agencies identified the following actions:
  1) Assess health risks over a longer period.
  2) Evaluate magnitude of affected land.
  3) Develop guidelines for developing acceptable indoor radiation levels.
  4) Develop guidelines for evaluating possible remediation of existing structures.
  5) Develop criteria for evaluating the potential for radiation exposure of undeveloped land.
  6) Identify/evaluate potential remediation techniques.
- 1978 EPA reported addressed items 1, 3, 4, 5. Industry efforts focused on item 6.

❑ SCOPE OF STUDY

- 133 measurements of Radon and 1102 measurements of radiation in Polk County.
- Measurements made in structures over reclaimed, mineralized, non-mineralized, and unknown land.

❑ STUDY RESULTS

- Background estimates - gamma exposure rate - 35 mRem/yr; radon decay product level - 0.004 WL
- Tables 1 and 2 summarize outdoor gamma radiation measurements
- Tables 3 and 4 summarize indoor radon measurements

❑ REPORT EVALUATION OF POTENTIAL RISK

- Exposure to Radon at a level of 0.02 results in excess cancer risk of 3×10^{-2}.
- Annual dose of gamma radiation of 100 mRem/yr estimated to result in excess cancer risk of 4.7×10^{-3}
- Modifications to existing dwelling to achieved 40 to 80% reduction in radon levels range in cost from \$900 to \$2600[1]
- Modifications for existing dwelling to achieve 80% reduction in radiation levels estimated to range from \$15,000 to \$20,000[1]
- Modifications for planned dwellings to achieve 80% reduction in radiation levels estimated at \$600[1].

❑ REPORT EVALUATION OF COST-EFFECTIVENESS

- Ratio of present worth cost of control measure to reduction in health-risk anticipated.
- Uranium Fuel Cycle Std. suggests \$200,000 to \$500,000 in remedial expenditures are reasonable to advert one adverse health effect.
- Radon cost control measures in existing structures could result in \$12,000 to \$35,000[1] per health effect adverted.
- Radiation cost control measures in existing structures could result in \$800,000 to \$1,200,000[1] per health effect adverted.
- Radiation cost control measures in existing structures could result in \$28,000[1] per health effect averted.

Notes:
1 - Costs would need to be multiplied by a factor of 2.5 to convert to 2003 dollars

❑ REPORT POTENTIAL EVALUATION CRITERIA

- Federal Radiation Council 1960 guideline for annual whole body gamma exposure - 500 mRem/yr; and 170 m/Rem/yr for sensitive individual.
- Recommended actions for radiation exposure levels Table 5.

❑ REPORT CONCLUSIONS

- Cost-effective to retrofit existing structures or plan new structures to reduce radon levels.
- Cost-effective to plan new structures to reduce gamma radiation levels to 30 mRem/yr, resulting in estimated risk of 1×10^{-3}.
- Not cost-effective to retrofit existing structure to reduce gamma radiation levels.

❑ DISCUSSION OF RESULTS

- FDOH Comments:
  - Radon protection measures in place at county level; no EPA involvement required.
  - Concrete slabs provide effective shielding for indoor gamma radiation exposures.
  - No State or local regs. in place that require slab construction; as a practical matter, 99+% of new constructions use concrete slab foundations.
  - No EPA involvement is need to assess/address potential gamma exposure in existing dwelling or planned dwellings.
  - Oakbridge subdivision may be an exception since its reported to have used craw space construction. Additional assessment may be needed.

- EPA Considerations:
  - Report acknowledged that monitoring was conducted to screen out anomalously high areas of radiation.
  - Borden study designed to identify high areas of radiation.
  - Study identified 26% of homes with indoor gamma levels in the range of 66 to 120 mRem/yr vs. the Superfund criterion of 15 mRem/yr.
  - Study identified 7% of homes with indoor gamma levels exceeding 120 mRem/yr (or 20 μr/yr) vs 100 mRem/yr recommended by ATSDR at Stauffer (and the 20 μr/hr established by FDOH and UMTRCA.
  - Study did not address potential outdoor gamma exposures.

❑ POTENTIAL ALTERNATIVES

- Alternative 1:
  - Continue survey work as originally proposed.
- Alternative 2:
  - Rely on report findings and FDOH Conclusions
  - Assume existing structures adequately protected by slab construction
  - Assume existing structures w/o slab construction not cost-effective to retrofit.
  - Conduct no further assessment of existing structures or attempt to influence any future development requirements for slab construction.
  - Also use Report and FDOH conclusions to determine no further federal action required for 21 sites in CERCLIS.
- Alternative 3:
  - Same as alternative 2 with the following exceptions:
  - Conduct further assessment of Oakbridge Subdivision
  - Collect radiation survey data to assess 21 sites in CERCLA.

TABLE 1
EPA RADIATION SURVEY - 1978
DEVELOPED FORMER PHOSPHATE SITES
OUTDOOR GAMMA RANGES

Location	Radiation Doses - mRem/yr[1]				Number of Measurements
	0 to 60	66 to 120	126 to 180	> 180	
Auburndale	15				15
Babson Park	1				1
Bartow	44	19	4		67
Bradley	4	1			5
Davenport	25				25
Dundee	22	1			23
Eagle Lake	1				1
Eaton Park	18	3	2		23
Fort Meade	9	10	4		23
Frostproof	23	7			30
Haines City	37				37
Highland City	1				1
Lake Alfred	1				1
Lakeland	466	127	21	2	616
Lake Whales	35				35
Mulberry	41	47	10	3	101
Pierce	2	2	1		5
Polk City	24				24
Winter Haven	69				69
Total	838	217	42	5	1102

1 - Dose based on residential exposure.

TABLE 2
OUTDOOR EXTERNAL GAMMA EXPOSURE
BY LAND CATEGORY

Level (mRem/yr) [1]	Reclaimed (N=672)	Mineralized (N=102)	Non-Mineralized (N=300)
Greater than 120	7%	1%	0%
66 to 120	26%	4%	3%
less than 66	67%	95%	97%
Avg. Gamma Exposure	66 mRem/yr	42 mRem/yr	36 mRem/yr

1 - Dose based on residential scenario.

TABLE 3
DISTRIBUTION OF INDOOR RADON DECAY LEVELS
BY LAND CATEGORY

Land Use	Number of Measurements	Less than 0.01 (gross WL)	0.01 to 0.03 (gross WL)	0.03 to 0.05 (gross WL)	Greater than 0.05 (gross WL)
Reclaimed	93	59%	20%	13%	8%
Mineralized	9	44%	44%	12%	0
Non-Minerialized	29	97%	3%	0	0
Unknown	2	0	100%	0	0

TABLE 4
DISTRIBUTION OF INDOOR RADON DECAY PRODUCT LEVELS
SLAB AND CRAWLSPACE CONSTRUCTION

Level (gross WL)	Slab (N =77)	Crawlspace (including trailers) (N=22)
Less than 0.01	56%	82%
0.01 to 0.03	23%	9%
0.03 to 0.05	12%	9%
Greater than 0.05	9%	0%

TABLE 5
RECOMMENDED ACTIONS FOR RADIATION EXPOSURE LEVELS

EXPOSURE LEVELS	RECOMMENDATIONS
External Gamma Radiation	
Greater than 600 mRem/yr	Remedial Action Indicated
From 300 mRem/yr to 600 mRem/yr	Remedial Action May be Needed
Less than 300 mRem/yr	No Action Indicated
Indoor Radon Daughter Products	
Greater than 0.05 WL	Remedial Action Indicated
From 0.01 to 0.05 WL	Remedial Action May be Needed
Less than 0.01 WL	No Action Indicated